

# IMPROVED PROPELLING CHARGE SUPPORT FOR A MORTAR CARTRIDGE

## DESCRIPTION

### FEDERAL INTEREST STATEMENT

**[Para 1]** The inventions described herein may be manufactured, used and licensed by or for the U.S. Government for U.S. Government purposes.

### FIELD OF THE INVENTION

**[Para 2]** The present invention generally relates to protection of munitions during storage, transportation and handling. More specifically, the present invention pertains to a propelling charge support for protecting 60mm mortar cartridge propelling charges without the use of foam. In addition, the invention also serves as an assembly aid.

### BACKGROUND OF THE INVENTION

**[Para 3]** Munitions, such as 60mm mortar cartridges, typically utilize some form of propelling charge support assembly to protect the propelling charges during transportation and handling. Conventional propelling charge support assemblies utilize foam to cushion the 60mm mortar cartridge propelling charges. Although conventional propelling charge support assemblies have proven to be useful, it would be desirable to present additional improvements.

**[Para 4]** The type of foam utilized on the conventional propelling charge support assembly is required to meet stringent performance requirements

during tactical use. Foam that meets these stringent performance requirements has been difficult to procure and can be expensive. Further, foam degrades with age. As the foam degrades, the ability of the propelling charge support assembly to protect munitions also degrades. In addition, conventional propelling charge support assemblies using foam require additional manpower during assembly, which leads to higher propelling charge support assembly unit costs.

[Para 5] What is needed is a propelling charge support for munitions that does not require foam yet still provides adequate protection for the 60mm mortar cartridge during transportation and handling. The need for such a system has heretofore remained unsatisfied.

## SUMMARY OF THE INVENTION

[Para 6] The improved propelling charge support satisfies this need, providing protection without the use of foam for munitions such as a 60mm mortar cartridge. The improved propelling charge support comprises horseshoe-shaped clips for engaging the tail fin and holding the cartridge together for protection. The tail fin comprises six individual fin blades. The improved propelling charge support further comprises a rounded saddle for holding the propelling charges securely. The improved propelling charge support has winged edges to protect the charges and aid in removal of the propelling charge support from the tail fin of the cartridge. The improved propelling charge support further comprises a flat outer surface on which the propelling charge support can rest while the propelling charge support is assembled to the cartridge tail fin.

[Para 7] In one embodiment, the improved propelling charge support comprises a fin engagement clip that interfaces with an individual fin blade on the tail fin when installed on the cartridge. The fin engagement clip prevents

rotation of the improved propelling charge support and propelling charges about the tail fin axis, preventing damage to the propelling charges.

[Para 8] The improved propelling charge support eliminates the use of foam, while still providing protection to the cartridge during transportation and handling. This is a less expensive alternative to conventional propelling charge support assemblies because the foam is expensive and difficult to obtain. The improved propelling charge support has long life and resists degradation through age.

[Para 9] Further, eliminating the use of foam reduces manufacturing time compared to that of conventional approaches. Conventional propelling charge support assemblies require foam be secured to the propelling charge support with glue or tape. This process is time consuming and expensive.

## BRIEF DESCRIPTION OF THE DRAWINGS

[Para 10] The various features of the present invention and the manner of attaining them will be described in greater detail with reference to the following description, claims, and drawings, wherein reference numerals are reused, where appropriate, to indicate a correspondence between the referenced items, and wherein:

[Para 11] FIG. 1 is a cross-sectional view of an exemplary operating environment in which an improved propelling charge support of the present invention can be used;

[Para 12] FIG. 2 is comprised of FIGS. 2A and 2B that illustrate a perspective view and a cross-sectional view of the side of the improved propelling charge support of FIG. 1, respectively;

[Para 13] FIG. 3 is a diagram illustrating a perspective view of a tail end of the improved propelling charge support of FIG. 1;

[Para 14] FIG. 4 is a diagram illustrating a perspective view of the top of the improved propelling charge support of FIG. 1;

[Para 15] FIG. 5 is a diagram illustrating a further perspective view of the tail end of the improved propelling charge support of FIG. 1 featuring a fin stabilizer; and

[Para 16] FIGS. 6 and 7 are diagrams illustrating the orientation of the propelling charges within the propelling charge support prior to assembly to the cartridge.

#### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[Para 17] FIG. 1 illustrates an exemplary environment in which a system and method for protecting a 60mm mortar cartridge prior to use with an improved propelling charge support (the foamless propelling charge support 10) may be used. In one embodiment, the improved propelling charge support 10 comprises injection molded high impact polystyrene, High Density Polyethylene (HDPE) or other resins meeting equivalent performance. Sequential rough handling tests shall be performed to qualify appropriate resin materials for meeting performance requirements.

[Para 18] As shown in the cut away drawing of FIG. 1, improved propelling charge support 10 protects the four propelling charges shipped with a 60mm mortar cartridge 15 (also referenced herein as cartridge 15).

[Para 19] The improved propelling charge support 10 is illustrated by the long side perspective view of FIG. 2. The length L of the improved propelling charge support 10 is approximately 9.86 cm, the height H is approximately 4.83 cm, and the width W (see Fig. 3) is approximately 4.45 cm.

[Para 20] The improved propelling charge support 10 comprises a rounded saddle 205 with aggressive etching. The rounded saddle 205 comes in contact with the propelling charges 12. The aggressive etching of the rounded saddle 205 prevents movement of the propelling charges 12 relative to the improved propelling charge support 10.

[Para 21] The improved propelling charge support 10 comprises retaining clips 210 for engaging the tail fin of the cartridge 15. The improved propelling charge support 10 further comprises two detented clips 215 for engaging the propelling charges 12. One non-detented clip 210 is illustrated in FIG. 2. The retaining clips 215 and the non-detented clip 210 are shaped to constrain propelling charges 12 during transportation and handling. The non-detented clip 210 and the retaining clip 215 keep charges from moving along a cartridge during transportation or severe handling such as a drop.

[Para 22] The improved propelling charge support 10 is further illustrated by the end perspective view of FIG. 3. The improved propelling charge support 10 comprises winged edges 305. The winged edges 305 protect the propelling charges 12 from impact and aid during removal of the improved propelling charge support 10 from the cartridge 15.

[Para 23] FIG. 4 is a diagram illustrating a bottom perspective view of the improved propelling charge support 10. A flat outer surface 405 opposite the rounded saddle 205 allows the improved propelling charge support 10 to sit on a flat surface. The flat outer surface 405 aids during load, assemble, and

pack (LAP) operations by allowing propelling charges 12 to be set up within the foamless propelling charge support 10 prior to installation to tail fin of cartridge 15. The improved propelling charge support 10 and propelling charges 12 are then installed (as a unit) on the cartridge 15 while the propelling charges 12 are sitting in the improved propelling charge support 10. Figure 6 depicts the improved propelling charge support with propelling charges installed and their orientation for use as an assembly aid.

[Para 24] FIG. 5 is a diagram illustrating an end perspective view of one embodiment of the improved propelling charge support 10. In this embodiment, the improved propelling charge support 10 comprises a fin engagement clip 505. The fin engagement clip 505 comprises protrusions 510 that interface with a single fin blade on the cartridge 15. The fin stabilizer 505 prevents rotation of the improved propelling charge support 10 and the propelling charges 12 about the center axis, preventing damage to the propelling charges 12.

[Para 25] It is to be understood that the specific embodiments of the invention that have been described are merely illustrative of certain applications of the principle of the present invention. Numerous modifications may be made to the system and method for protecting a 60mm mortar cartridge prior to use with an improved propelling charge support described herein without departing from the spirit and scope of the present invention.